Uva Wellassa University, Sri Lanka
End Semester Examination – June 2009
STA 201-2 Statistical Methods (Repeat paper)

Part B: Essay Questions
Answer All Questions
Total Marks = 70

1. A pharmaceutical company has developed a new headache treatment which is being field tested on 1000 volunteers. In a test some volunteers have received the treatment and some a placebo (a harmless neutral substance). The results of the test are as follows:

	Treatment received	Placebo received
Some improvement	600	125
No improvement	150	125

Calculate:

a) the probability that a volunteer has shown some improvement.
b) the conditional probability that the volunteer has shown some improvement given that he or she has received the treatment.
c) the conditional probability that the volunteer has received the treatment given that no improvement has been observed.
d) the conditional probability that the volunteer has received the placebo given that some improvement has been observed.
e) Explain briefly what the evidence in the table suggests to you about the effectiveness of the treatment.

(15 marks)

2. A financial analyst is interested in computing the turnover rates, in percent, for shares of oil- related stocks versus other stocks, such as GE and IBM. She selected 32 oil-related stocks and 49 other stocks. The mean turnover rate of oil-related stocks is 31.4 percent and the standard deviation 5.1 percent. For the other stocks, the mean rate was computed to be 34.9 percent and the standard deviation 6.7 percent. The financial analyst is interested in testing whether there is significant difference in the turnover rates of the two types of stock.
   a) Is this a one-tailed or a two-tailed test?
   b) Using the 0.01 level of significance, what is the decision rule?
   c) Determine the value of the test statistic, and arrive at a decision regarding H_0. Explain the meaning of your decision

(15 marks)

3. A glass bottle manufacturing company has recorded data on the average number of defects per 10,000 bottles and the number of weeks since the last machine service. A part of the MINITAB output is given from the analysis of data as below.

Observation	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Detects (per 1000)	13	16.1	14.5	17.8	22	27.4	16.8	34.2	65.6	49.2	66.2	81.2	87.5	114.5
Weeks	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Predictor	Coef.	St.Dev .	T	p
Constant	-31.698	9.776	-3.24	0.007
X	7.2767	0.8692	8.37	0.000

ANOVA Table

Source	DF	SS	MS	F	P
Regression	-----	-----	-----	-----	0.000
Residual	-----	2062	-----		
Total	-----	14109			

Answer the following questions:

a) What is the fitted model?
b) What is the hypothesis that you intend to test in ANOVA table?
c) Complete the ANOVA table
d) What is your conclusion in ANOVA table based on P-value?
e) What can you say about the significance of the coefficients?
f) Proportion of variation in data explained by the regression relation is:

(20 marks)

4. An experiment was conducted to study the performance of four tomato varieties in a green house. Tomato varieties assigned to experimental units randomly. The experiment contained 20 plots and the yield values recorded from each plot are given in below.

Variety	Yield				
1	1.6	1.9	1.5	2.1	1.7
2	1.9	2.4	2.3	2.2	2.1
3	2.3	2.6	2.4	2.5	2.7
4	2.6	2.8	3.0	2.9	2.8

a). Write the appropriate model for the observations of this study.

b). Suppose that in usual notation, SSTotal= 3.6455 and SSE = 0.5680. Construct the ANOVA table.

c). Defining your hypotheses, interpret the F test presented in the ANOVA table. Write down your conclusion in words.

d). Interpret the following MINITAB output.

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                                  Individual 95% CIs For Mean Based on Pooled StDev
Level  N    Mean   StDev    +---------+---------+---------+---------
1      5  1.7600  0.2408    (---*---)
2      5  2.1800  0.1924              (---*----)
3      5  2.5000  0.1581                        (---*----)
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(20 marks)